REMARKS

With this amendment, claims 2-63 and 197 are pending. Reconsideration of the present application is respectfully requested in view of the present amendments and remarks.

Amendments to the Claims

In order to facilitate prosecution, Applicants have amended the claims in accordance with the comments of the Examiner in the Office Action issued on July 2, 2002. Claims 2-63 have been amended, and claim 1 has been cancelled. Claim 197 has been added in accordance with the comments of the Examiner. These amendments are made without prejudice or disclaimer to the subject matter contained therein. Support for these amendments and added claims can be found in the Specification and in the Examples. No new matter has been added. Accordingly, the claims as amended are fully patentable and Applicants urge that all remaining rejections be withdrawn.

Rejections under 35 U.S.C. § 112, ¶2

Claim 1 is rejected to under 35 U.S.C. § 112, second paragraph, as being an indefinite omnibus claim for failing to point out what is included or excluded by the claim language. In addition, Claims 1-64 (*sic*, 1-63) are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. It is respectfully submitted that the cancellation of claim 1 and the amendments to claims 2-63, which all depend from new claim 197 linking the body of the claim to the preamble, overcome this rejection. Support for these amendments is found in the Specification at pages 25, *et seq.*

Accordingly, Applicants respectfully request that the bases of the present rejection of claims 1-63 be withdrawn.

Rejections under 35 U.S.C. § 102(b) and 103(a)

Claims 1-63 are rejected under 35 U.S.C. § 102(b) as being anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as being obvious over Malfroy-Camine, et al. Claim 1 has been cancelled, so only claims 2-63 stand rejected on the basis that they are anticipated or, in the alternative, obvious. Applicants respectfully submit that because claims 2-63 now depend on new claim 197, which requires at least one non-proteinaceous catalyst or precursor ligand of the non-proteinaceous catalyst ***attached*** to a biomaterial substantially compatible with a biological system, this rejection is rendered moot.

Malfroy-Camine teaches only methods of using salen-metal antioxidants for the treatment of certain diseases. Nowhere in this reference is contained a description of the

salen-metal antioxidant attached to a biomaterial for dismutating superoxide in a biological system. Malfroy-Camine simply teaches administering the salen-metal antioxidants to a subject in free form. Therefore, this reference does not teach one skilled in the art how to make or use a non-proteinaceous catalyst or precursor ligand attached to a biomaterial. Accordingly, Malfroy-Camine does not disclose a non-proteinaceous catalyst or precursor ligand of the non-proteinaceous catalyst attached to a biomaterial substantially compatible with a biological system as required by each claim as amended. Because it is not possible to simply extrapolate the free form antioxidant features of this reference to the non-proteinaceous catalyst attached to a biomaterial of the present invention, the Malfroy-Camine reference is not analogous art that enables the practice of Applicants' claimed invention under either 35 U.S.C. §§ 102 or 103.[1] For this reason, this prior art rejection cannot stand as based on Malfroy-Camine (either alone or in combination with other references) and the application is consequently allowable because the prior art cited does not teach all the features of any pending claim.[2]

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[1] *See PPG Industries v. Guardian Industries Corp.*, 75 F.3d 1558, 1566 (Fed. Cir. 1996) ("[t]o anticipate a claim [under 35 U.S.C. § 102] a reference must disclose every element of the challenged claim and enable one skilled in the art to make the anticipating subject matter"). *See also* M.P.E.P. 904.01(c) (a prior art reference is not considered analogous to a claimed invention when the essential utility of the subject matter covered by the claims is not covered by that prior art reference); *Heidelberger Drucksmaschinen AG v. Hantscho Commercial Prods.*, 21 F.3d 1068, 1071-72 (Fed. Cir. 1994) (in order to be considered analogous art, the relied upon reference must be pertinent to the problem the inventor was attempting to solve). *See also Motorola v. Interdigital Technology Corp.*, 121 F.3d 1461, 1471 (Fed. Cir. 1997) ("[i]n order to render a claimed apparatus or method obvious [under 35 U.S.C. § 103], the prior art must enable one skilled in the art to make and use the apparatus or method").

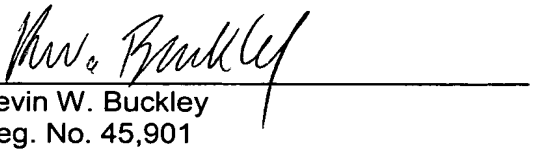
[2] *See* M.P.E.P. 2143.01 ("in order to rely on a reference as a basis for rejection the reference must ... be in the field of applicant's endeavor...."). *See also In re Fritch*, 972 F.2d 1260, 1265-66 (Fed. Cir. 1992) (a finding of obviousness cannot be supported where the relied-upon art does not suggest the changes necessary to conform the reference to the claimed invention: "[t]he mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification"); *In re Bond*, 910 F.2d 831, 832 (Fed. Cir. 1990) (a finding of obviousness cannot be supported by prior art where critical structural differences exist between the claimed invention and the relied-upon art); *In re Fine*, 837 F.2d 1071, 1076 (Fed. Cir. 1988) (dependent claims are allowable if independent claims from which they depend are allowable).

CONCLUSION

For the foregoing reasons, prompt reconsideration and allowance of claims 2-63 and 197, as amended, is respectfully requested.

It is not believed that payment of a fee is due at this time. However, any deficiency or overpayment may be charged to Deposit Account No. 19-3140.

Respectfully submitted,



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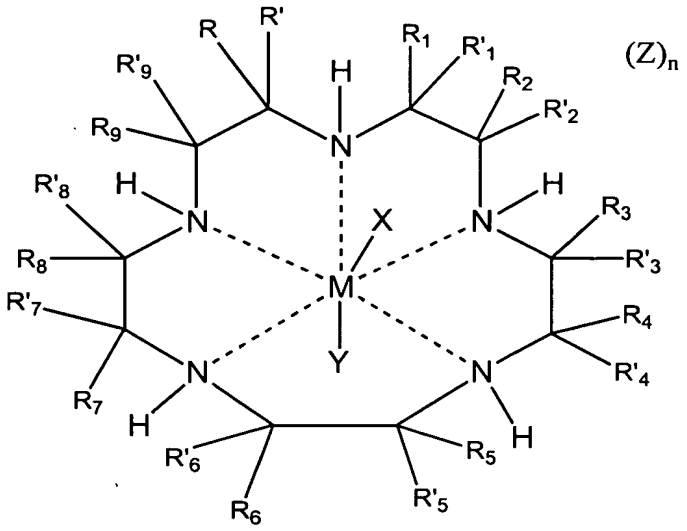
VERSION WITH MARKINGS TO SHOW CHANGES MADE

Claim 2 has been amended as follows:

2. (amended) The modified biomaterial of claim 197, wherein the non-proteinaceous catalyst for the dismutation of superoxide is selected from the group consisting of manganese(II) pentaaza complexes, manganese(III) pentaaza complexes, iron(II) pentaaza complexes, iron(III) pentaaza complexes, manganese(II) salen complexes, manganese(III) salen complexes, iron(II) salen complexes, iron(III) salen complexes, manganese(II) porphyrin complexes, manganese(III) porphyrin complexes, iron(II) porphyrin complexes, and iron(III) porphyrin complexes.

Claim 3 has been amended as follows:

3. (amended) The modified biomaterial of claim 197, wherein the non-proteinaceous catalyst for the dismutation of superoxide is selected from the group consisting of manganese and iron chelates of pentaazacyclopentadecane compounds, which are represented by the following formula:



wherein M is a cation of a transition metal[, preferably] selected from the group consisting of manganese [or] and iron;

wherein R, R', R_1, R'_1, R_2, R'_2, R_3, R'_3, R_4, R'_4, R_5, R'_5, R_6, R'_6, R_7, R'_7, R_8, R'_8, R_9, and R'_9 independently represent hydrogen, or substituted or unsubstituted alkyl, alkenyl, alkynyl, cycloalkyl, cycloalkenyl, cycloalkylalkyl, cycloalkylcycloalkyl, cycloalkenylalkyl, alkylcycloalkyl, alkylcycloalkenyl, alkenylcycloalkyl, alkenylcycloalkenyl, heterocyclic, aryl and aralkyl radicals;

wherein R_1 or R'_1 and R_2 or R'_2, R_3 or R'_3 and R_4 or R'_4, R_5 or R'_5 and R_6 or R'_6, R_7 or R'_7 and R_8 or R'_8, and R_9 or R'_9 and R or R' together with the carbon atoms to which they are

attached independently form a substituted or unsubstituted, saturated, partially saturated or unsaturated cyclic or heterocyclic having 3 to 20 carbon atoms;

wherein R or R' and R_1 or R'_1, R_2 or R'_2 and R_3 or R'_3, R_4 or R'_4 and R_5 or R'_5, R_6 or R'_6 and R_7 or R'_7, and R_8 or R'_8 and R_9 or R'_9 together with the carbon atoms to which they are attached independently form a substituted or unsubstituted nitrogen containing heterocycle having 2 to 20 carbon atoms, provided that when the nitrogen containing heterocycle is an aromatic heterocycle which does not contain a hydrogen attached to the nitrogen, the hydrogen attached to the nitrogen as shown in the above formula, which nitrogen is also in the macrocyclic ligand or complex, and the R groups attached to the included carbon atoms of the macrocycle are absent;

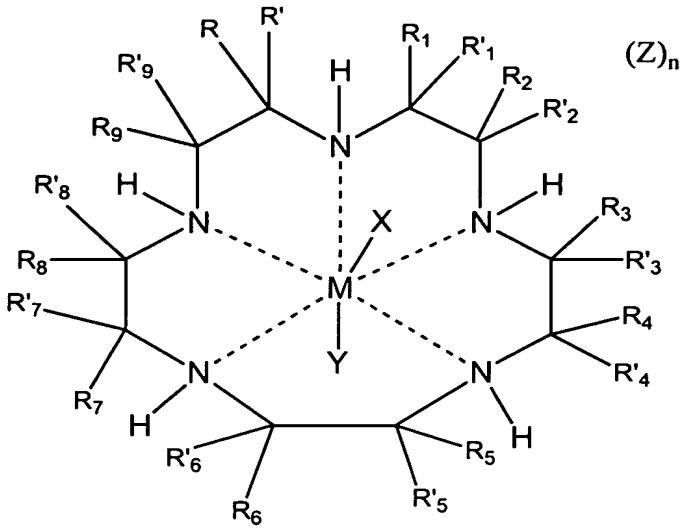
wherein R and R', R_1 and R'_1, R_2 and R'_2, R_3 and R'_3, R_4 and R'_4, R_5 and R'_5, R_6 and R'_6, R_7 and R'_7, R_8 and R'_8, and R_9 and R'_9 together with the carbon atom to which they are attached independently form a saturated, partially saturated, or unsaturated cyclic or heterocyclic having 3 to 20 carbon atoms; and

wherein one of R, R', R_1, R'_1, R_2, R'_2, R_3, R'_3, R_4, R'_4, R_5, R'_5, R_6, R'_6, R_7, R'_7, R_8, R'_8, R_9, and R'_9 together with a different one of R, R', R_1, R'_1, R_2, R'_2, R_3, R'_3, R_4, R'_4, R_5, R'_5, R_6, R'_6, R_7, R'_7, R_8, R'_8, R_9, and R'_9 which is attached to a different carbon atom in the macrocyclic ligand may be bound to form a strap represented by the formula:

$$- (CH_2)_x - M - (CH_2)_w - L - (CH_2)_z - I - (CH_2)_y -$$

wherein w, x, y and z independently are integers from 0 to 10 and M, L and J are independently selected from the group consisting of alkyl, alkenyl, alkynyl, aryl, cycloalkyl, heteroaryl, alkaryl, alkheteroaryl, aza, amide, ammonium, oxa, thia, sulfonyl, sulfinyl, sulfonamide, phosphoryl, phosphinyl, phosphino, phosphonium, keto, ester, alcohol, carbamate, urea, thiocarbonyl, borates, boranes, boraza, silyl, siloxy, silaza and combinations thereof; and combinations thereof; and

wherein X, Y and Z are independently selected from the group consisting of halide, oxo, aquo, hydroxo, alcohol, phenol, dioxygen, peroxo, hydroperoxo, alkylperoxo, arylperoxo, ammonia, alkylamino, arylamino, heterocycloalkyl amino, heterocycloaryl amino, amine oxides, hydrazine, alkyl hydrazine, aryl hydrazine, nitric oxide, cyanide, cyanate, thiocyanate, isocyanate, isothiocyanate, alkyl nitrile, aryl nitrile, alkyl isonitrile, aryl isonitrile, nitrate, nitrite, azido, alkyl sulfonic acid, aryl sulfonic acid, alkyl sulfoxide, aryl sulfoxide, alkyl aryl sulfoxide, alkyl sulfenic acid, aryl sulfenic acid, alkyl sulfinic acid, aryl sulfinic acid, alkyl thiol carboxylic acid, aryl thiol carboxylic acid, alkyl thiol thiocarboxylic acid, aryl thiol thiocarboxylic acid, alkyl carboxylic acid (such as acetic acid, trifluoroacetic acid, oxalic acid), aryl carboxylic acid (such as benzoic acid, phthalic acid), urea, alkyl urea, aryl urea,



wherein M is a cation of a transition metal[, preferably] selected from the group consisting of manganese [or] and iron;

wherein R, R', R_1, R'_1, R_2, R'_2, R_3, R'_3, R_4, R'_4, R_5, R'_5, R_6, R'_6, R_7, R'_7, R_8, R'_8, R_9, and R'_9 independently represent hydrogen, or substituted or unsubstituted alkyl, alkenyl, alkynyl, cycloalkyl, cycloalkenyl, cycloalkylalkyl, cycloalkylcycloalkyl, cycloalkenylalkyl, alkylcycloalkyl, alkylcycloalkenyl, alkenylcycloalkyl, alkenylcycloalkenyl, heterocyclic, aryl and aralkyl radicals;

wherein R_1 or R'_1 and R_2 or R'_2, R_3 or R'_3 and R_4 or R'_4, R_5 or R'_5 and R_6 or R'_6, R_7 or R'_7 and R_8 or R'_8, and R_9 or R'_9 and R or R' together with the carbon atoms to which they are attached independently form a substituted or unsubstituted, saturated, partially saturated or unsaturated cyclic or heterocyclic having 3 to 20 carbon atoms;

wherein R or R' and R_1 or R'_1, R_2 or R'_2 and R_3 or R'_3, R_4 or R'_4 and R_5 or R'_5, R_6 or R'_6 and R_7 or R'_7, and R_8 or R'_8 and R_9 or R'_9 together with the carbon atoms to which they are attached independently form a substituted or unsubstituted nitrogen containing heterocycle having 2 to 20 carbon atoms, provided that when the nitrogen containing heterocycle is an aromatic heterocycle which does not contain a hydrogen attached to the nitrogen, the hydrogen attached to the nitrogen as shown in the above formula, which nitrogen is also in the macrocyclic ligand or complex, and the R groups attached to the included carbon atoms of the macrocycle are absent;

wherein R and R', R_1 and R'_1, R_2 and R'_2, R_3 and R'_3, R_4 and R'_4, R_5 and R'_5, R_6 and R'_6, R_7 and R'_7, R_8 and R'_8, and R_9 and R'_9 together with the carbon atom to which they are attached independently form a saturated, partially saturated, or unsaturated cyclic or heterocyclic having 3 to 20 carbon atoms; and

wherein one of R, R', R_1, R'_1, R_2, R'_2, R_3, R'_3, R_4, R'_4, R_5, R'_5, R_6, R'_6, R_7, R'_7, R_8, R'_8, R_9, and R'_9 together with a different one of R, R', R_1, R'_1, R_2, R'_2, R_3, R'_3, R_4, R'_4, R_5, R'_5, R_6,

R'_6, R_7, R'_7, R_8, R'_8, R_9, and R'_9 which is attached to a different carbon atom in the macrocyclic ligand may be bound to form a strap represented by the formula:

$$- (CH_2)_x - M - (CH_2)_w - L - (CH_2)_z - I - (CH_2)_y -$$

wherein w, x, y and z independently are integers from 0 to 10 and M, L and J are independently selected from the group consisting of alkyl, alkenyl, alkynyl, aryl, cycloalkyl, heteroaryl, alkaryl, alkheteroaryl, aza, amide, ammonium, oxa, thia, sulfonyl, sulfinyl, sulfonamide, phosphoryl, phosphinyl, phosphino, phosphonium, keto, ester, alcohol, carbamate, urea, thiocarbonyl, borates, boranes, boraza, silyl, siloxy, silaza and combinations thereof; and combinations thereof; and

wherein X, Y and Z are independently selected from the group consisting of halide, oxo, aquo, hydroxo, alcohol, phenol, dioxygen, peroxo, hydroperoxo, alkylperoxo, arylperoxo, ammonia, alkylamino, arylamino, heterocycloalkyl amino, heterocycloaryl amino, amine oxides, hydrazine, alkyl hydrazine, aryl hydrazine, nitric oxide, cyanide, cyanate, thiocyanate, isocyanate, isothiocyanate, alkyl nitrile, aryl nitrile, alkyl isonitrile, aryl isonitrile, nitrate, nitrite, azido, alkyl sulfonic acid, aryl sulfonic acid, alkyl sulfoxide, aryl sulfoxide, alkyl aryl sulfoxide, alkyl sulfenic acid, aryl sulfenic acid, alkyl sulfinic acid, aryl sulfinic acid, alkyl thiol carboxylic acid, aryl thiol carboxylic acid, alkyl thiol thiocarboxylic acid, aryl thiol thiocarboxylic acid, alkyl carboxylic acid (such as acetic acid, trifluoroacetic acid, oxalic acid), aryl carboxylic acid (such as benzoic acid, phthalic acid), urea, alkyl urea, aryl urea, alkyl aryl urea, thiourea, alkyl thiourea, aryl thiourea, alkyl aryl thiourea, sulfate, sulfite, bisulfate, bisulfite, thiosulfate, thiosulfite, hydrosulfite, alkyl phosphine, aryl phosphine, alkyl phosphine oxide, aryl phosphine oxide, alkyl aryl phosphine oxide, alkyl phosphine sulfide, aryl phosphine sulfide, alkyl aryl phosphine sulfide, alkyl phosphonic acid, aryl phosphonic acid, alkyl phosphinic acid, aryl phosphinic acid, alkyl phosphinous acid, aryl phosphinous acid, phosphate, thiophosphate, phosphite, pyrophosphite, triphosphate, hydrogen phosphate, dihydrogen phosphate, alkyl guanidino, aryl guanidino, alkyl aryl guanidino, alkyl carbamate, aryl carbamate, alkyl aryl carbamate, alkyl thiocarbamate aryl thiocarbamate, alkyl aryl thiocarbamate, alkyl dithiocarbamate, aryl dithiocarbamate, alkyl aryl dithiocarbamate, bicarbonate, carbonate, perchlorate, chlorate, chlorite, hypochlorite, perbromate, bromate, bromite, hypobromite, tetrahalomanganate, tetrafluoroborate, hexafluorophosphate, hexafluoroantimonate, hypophosphite, iodate, periodate, metaborate, tetraaryl borate, tetra alkyl borate, tartrate, salicylate, succinate, citrate, ascorbate, saccharinate, amino acid, hydroxamic acid, thiotosylate, and anions of ion exchange resins.

Claim 37 has been amended as follows:

37. (amended) The modified biomaterial of claim 34, wherein the non-proteinaceous catalyst for the dismutation of superoxide is selected from the group consisting of Compounds 1-54 of Table 1.

Claim 38 has been amended as follows:

38. (amended) The modified biomaterial of claim 34, wherein the non-proteinaceous catalyst for the dismutation of superoxide is selected from the group consisting of Compounds 16, 27, 38, 40, 42, 43, 51, 52, 53, and 54 of Table 1.

Claim 39 has been amended as follows:

39. (amended) The modified biomaterial of claim 35, 36, 37, or 38, wherein the non-proteinaceous catalyst is present at a concentration of about 0.001 to about 25 weight percent.

Claim 40 has been amended as follows:

40. (amended) The modified biomaterial of claim 35, 36, 37, or 38, wherein the non-proteinaceous catalyst is present at a concentration of about 0.01 to about 10 weight percent.

Claim 41 has been amended as follows:

41. (amended) The modified biomaterial of claim 35, 36, 37, or 38, wherein the non-proteinaceous catalyst is present at a concentration of about 0.05 to about 5 weight percent.

Claim 42 has been amended as follows:

42. (amended) The modified biomaterial of claim 197, wherein the [unmodified] biomaterial substantially compatible with a biological system is a biopolymer selected from the group consisting of[:] chitin, chitosan, cellulose, methyl cellulose, hyaluronic acid, keratin, fibroin, collagen, elastin, and saccharide polymers.

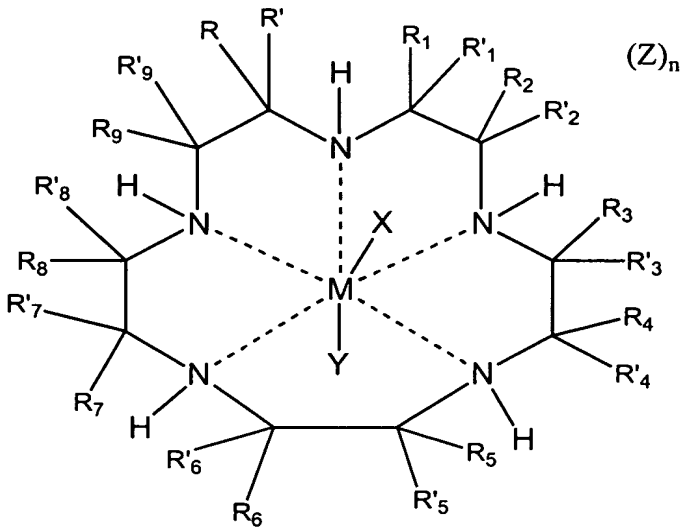
Claim 43 has been amended as follows:

43. (amended) The modified biomaterial of claim 42, wherein the non-proteinaceous catalyst for the dismutation of superoxide is selected from the group consisting of manganese(II) pentaaza complexes, manganese(III) pentaaza complexes, iron(II) pentaaza complexes, iron(III) pentaaza complexes, manganese(II) salen complexes, manganese(III) salen complexes, iron(II) salen complexes, iron(III) salen complexes,

manganese(II) porphyrin complexes, manganese(III) porphyrin complexes, iron(II) porphyrin complexes, and iron(III) porphyrin complexes.

Claim 44 has been amended as follows:

44. (amended) The modified biomaterial of claim 42, wherein the non-proteinaceous catalyst for the dismutation of superoxide is selected from the group consisting of manganese and iron chelates of pentaazacyclopentadecane compounds, which are represented by the following formula:



wherein M is a cation of a transition metal[, preferably] selected from the group consisting of manganese [or] and iron;

wherein R, R', R_1, R'_1, R_2, R'_2, R_3, R'_3, R_4, R'_4, R_5, R'_5, R_6, R'_6, R_7, R'_7, R_8, R'_8, R_9, and R'_9 independently represent hydrogen, or substituted or unsubstituted alkyl, alkenyl, alkynyl, cycloalkyl, cycloalkenyl, cycloalkylalkyl, cycloalkylcycloalkyl, cycloalkenylalkyl, alkylcycloalkyl, alkylcycloalkenyl, alkenylcycloalkyl, alkenylcycloalkenyl, heterocyclic, aryl and aralkyl radicals;

wherein R_1 or R'_1 and R_2 or R'_2, R_3 or R'_3 and R_4 or R'_4, R_5 or R'_5 and R_6 or R'_6, R_7 or R'_7 and R_8 or R'_8, and R_9 or R'_9 and R or R' together with the carbon atoms to which they are attached independently form a substituted or unsubstituted, saturated, partially saturated or unsaturated cyclic or heterocyclic having 3 to 20 carbon atoms;

wherein R or R' and R_1 or R'_1, R_2 or R'_2 and R_3 or R'_3, R_4 or R'_4 and R_5 or R'_5, R_6 or R'_6 and R_7 or R'_7, and R_8 or R'_8 and R_9 or R'_9 together with the carbon atoms to which they are attached independently form a substituted or unsubstituted nitrogen containing heterocycle having 2 to 20 carbon atoms, provided that when the nitrogen containing heterocycle is an aromatic heterocycle which does not contain a hydrogen attached to the

nitrogen, the hydrogen attached to the nitrogen as shown in the above formula, which nitrogen is also in the macrocyclic ligand or complex, and the R groups attached to the included carbon atoms of the macrocycle are absent;

wherein R and R', R_1 and R'_1, R_2 and R'_2, R_3 and R'_3, R_4 and R'_4, R_5 and R'_5, R_6 and R'_6, R_7 and R'_7, R_8 and R'_8, and R_9 and R'_9 together with the carbon atom to which they are attached independently form a saturated, partially saturated, or unsaturated cyclic or heterocyclic having 3 to 20 carbon atoms; and

wherein one of R, R', R_1, R'_1, R_2, R'_2, R_3, R'_3, R_4, R'_4, R_5, R'_5, R_6, R'_6, R_7, R'_7, R_8, R'_8, R_9, and R'_9 together with a different one of R, R', R_1, R'_1, R_2, R'_2, R_3, R'_3, R_4, R'_4, R_5, R'_5, R_6, R'_6, R_7, R'_7, R_8, R'_8, R_9, and R'_9 which is attached to a different carbon atom in the macrocyclic ligand may be bound to form a strap represented by the formula:

$$- (CH_2)_x - M - (CH_2)_w - L - (CH_2)_z - I - (CH_2)_y -$$

wherein w, x, y and z independently are integers from 0 to 10 and M, L and J are independently selected from the group consisting of alkyl, alkenyl, alkynyl, aryl, cycloalkyl, heteroaryl, alkaryl, alkheteroaryl, aza, amide, ammonium, oxa, thia, sulfonyl, sulfinyl, sulfonamide, phosphoryl, phosphinyl, phosphino, phosphonium, keto, ester, alcohol, carbamate, urea, thiocarbonyl, borates, boranes, boraza, silyl, siloxy, silaza and combinations thereof; and combinations thereof; and

wherein X, Y and Z are independently selected from the group consisting of halide, oxo, aquo, hydroxo, alcohol, phenol, dioxygen, peroxo, hydroperoxo, alkylperoxo, arylperoxo, ammonia, alkylamino, arylamino, heterocycloalkyl amino, heterocycloaryl amino, amine oxides, hydrazine, alkyl hydrazine, aryl hydrazine, nitric oxide, cyanide, cyanate, thiocyanate, isocyanate, isothiocyanate, alkyl nitrile, aryl nitrile, alkyl isonitrile, aryl isonitrile, nitrate, nitrite, azido, alkyl sulfonic acid, aryl sulfonic acid, alkyl sulfoxide, aryl sulfoxide, alkyl aryl sulfoxide, alkyl sulfenic acid, aryl sulfenic acid, alkyl sulfinic acid, aryl sulfinic acid, alkyl thiol carboxylic acid, aryl thiol carboxylic acid, alkyl thiol thiocarboxylic acid, aryl thiol thiocarboxylic acid, alkyl carboxylic acid (such as acetic acid, trifluoroacetic acid, oxalic acid), aryl carboxylic acid (such as benzoic acid, phthalic acid), urea, alkyl urea, aryl urea, alkyl aryl urea, thiourea, alkyl thiourea, aryl thiourea, alkyl aryl thiourea, sulfate, sulfite, bisulfate, bisulfite, thiosulfate, thiosulfite, hydrosulfite, alkyl phosphine, aryl phosphine, alkyl phosphine oxide, aryl phosphine oxide, alkyl aryl phosphine oxide, alkyl phosphine sulfide, aryl phosphine sulfide, alkyl aryl phosphine sulfide, alkyl phosphonic acid, aryl phosphonic acid, alkyl phosphinic acid, aryl phosphinic acid, alkyl phosphinous acid, aryl phosphinous acid, phosphate, thiophosphate, phosphite, pyrophosphite, triphosphate, hydrogen phosphate, dihydrogen phosphate, alkyl guanidino, aryl guanidino, alkyl aryl guanidino, alkyl

carbamate, aryl carbamate, alkyl aryl carbamate, alkyl thiocarbamate aryl thiocarbamate, alkyl aryl thiocarbamate, alkyl dithiocarbamate, aryl dithiocarbamate, alkyl aryl dithiocarbamate, bicarbonate, carbonate, perchlorate, chlorate, chlorite, hypochlorite, perbromate, bromate, bromite, hypobromite, tetrahalomanganate, tetrafluoroborate, hexafluorophosphate, hexafluoroantimonate, hypophosphite, iodate, periodate, metaborate, tetraaryl borate, tetra alkyl borate, tartrate, salicylate, succinate, citrate, ascorbate, saccharinate, amino acid, hydroxamic acid, thiotosylate, and anions of ion exchange resins.

Claim 45 has been amended as follows:

45. (amended) The modified biomaterial of claim 42, wherein the non-proteinaceous catalyst for the dismutation of superoxide is selected from the group consisting of Compounds 1-54 of Table 1.

Claim 46 has been amended as follows:

46. (amended) The modified biomaterial of claim 42, wherein the non-proteinaceous catalyst for the dismutation of superoxide is selected from the group consisting of Compounds 16, 27, 38, 40, 42, 43, 51, 52, 53, and 54 of Table 1.

Claim 47 has been amended as follows:

47. (amended) The modified biomaterial of claim 43, 44, 45, or 46, wherein the non-proteinaceous catalyst is present at a concentration of about 0.001 to about 25 weight percent.

Claim 48 has been amended as follows:

48. (amended) The modified biomaterial of claim 43, 44, 45, or 46, wherein the non-proteinaceous catalyst is present at a concentration of about 0.01 to about 10 weight percent.

Claim 49 has been amended as follows:

49. (amended) The modified biomaterial of claim 43, 44, 45, or 46, wherein the non-proteinaceous catalyst is present at a concentration of about 0.05 to about 5 weight percent.

Claim 50 has been amended as follows:

50. (amended) The modified biomaterial of claim 197, wherein the [unmodified] biomaterial substantially compatible with a biological system is a composite material comprising a relatively inelastic phase selected from the group consisting of carbon, hydroxy

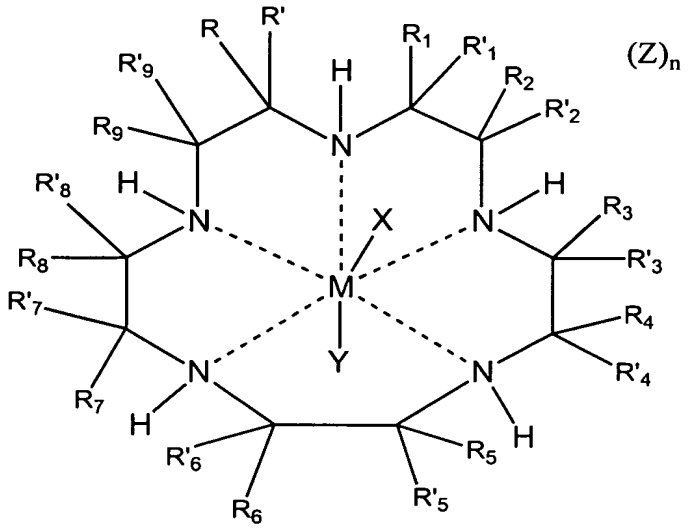
apatite, tricalcium phosphate, silicates, ceramics, and metals, and a relatively elastic phase selected from the group consisting of polymers and biopolymers.

Claim 51 has been amended as follows:

51. (amended) The modified biomaterial of claim 50, wherein the non-proteinaceous catalyst for the dismutation of superoxide is selected from the group consisting of manganese(II) pentaaza complexes, manganese(III) pentaaza complexes, iron(II) pentaaza complexes, iron(III) pentaaza complexes, manganese(II) salen complexes, manganese(III) salen complexes, iron(II) salen complexes, iron(III) salen complexes, manganese(II) porphyrin complexes, manganese(III) porphyrin complexes, iron(II) porphyrin complexes, and iron(III) porphyrin complexes.

Claim 52 has been amended as follows:

52. (amended) The modified biomaterial of claim 50, wherein the non-proteinaceous catalyst for the dismutation of superoxide is selected from the group consisting of manganese and iron chelates of pentaazacyclopentadecane compounds, which are represented by the following formula:



wherein M is a cation of a transition metal[, preferably] selected from the group consisting of manganese [or] and iron;

wherein R, R', R_1, R'_1, R_2, R'_2, R_3, R'_3, R_4, R'_4, R_5, R'_5, R_6, R'_6, R_7, R'_7, R_8, R'_8, R_9, and R'_9 independently represent hydrogen, or substituted or unsubstituted alkyl, alkenyl, alkynyl, cycloalkyl, cycloalkenyl, cycloalkylalkyl, cycloalkylcycloalkyl, cycloalkenylalkyl, alkylcycloalkyl, alkylcycloalkenyl, alkenylcycloalkyl, alkenylcycloalkenyl, heterocyclic, aryl and aralkyl radicals;

wherein R_1 or R'_1 and R_2 or R'_2, R_3 or R'_3 and R_4 or R'_4, R_5 or R'_5 and R_6 or R'_6, R_7 or R'_7 and R_8 or R'_8, and R_9 or R'_9 and R or R' together with the carbon atoms to which they are attached independently form a substituted or unsubstituted, saturated, partially saturated or unsaturated cyclic or heterocyclic having 3 to 20 carbon atoms;

wherein R or R' and R_1 or R'_1, R_2 or R'_2 and R_3 or R'_3, R_4 or R'_4 and R_5 or R'_5, R_6 or R'_6 and R_7 or R'_7, and R_8 or R'_8 and R_9 or R'_9 together with the carbon atoms to which they are attached independently form a substituted or unsubstituted nitrogen containing heterocycle having 2 to 20 carbon atoms, provided that when the nitrogen containing heterocycle is an aromatic heterocycle which does not contain a hydrogen attached to the nitrogen, the hydrogen attached to the nitrogen as shown in the above formula, which nitrogen is also in the macrocyclic ligand or complex, and the R groups attached to the included carbon atoms of the macrocycle are absent;

wherein R and R', R_1 and R'_1, R_2 and R'_2, R_3 and R'_3, R_4 and R'_4, R_5 and R'_5, R_6 and R'_6, R_7 and R'_7, R_8 and R'_8, and R_9 and R'_9 together with the carbon atom to which they are attached independently form a saturated, partially saturated, or unsaturated cyclic or heterocyclic having 3 to 20 carbon atoms; and

wherein one of R, R', R_1, R'_1, R_2, R'_2, R_3, R'_3, R_4, R'_4, R_5, R'_5, R_6, R'_6, R_7, R'_7, R_8, R'_8, R_9, and R'_9 together with a different one of R, R', R_1, R'_1, R_2, R'_2, R_3, R'_3, R_4, R'_4, R_5, R'_5, R_6, R'_6, R_7, R'_7, R_8, R'_8, R_9, and R'_9 which is attached to a different carbon atom in the macrocyclic ligand may be bound to form a strap represented by the formula:

$$- (CH_2)_x - M - (CH_2)_w - L - (CH_2)_z - I - (CH_2)_y -$$

wherein w, x, y and z independently are integers from 0 to 10 and M, L and J are independently selected from the group consisting of alkyl, alkenyl, alkynyl, aryl, cycloalkyl, heteroaryl, alkaryl, alkheteroaryl, aza, amide, ammonium, oxa, thia, sulfonyl, sulfinyl, sulfonamide, phosphoryl, phosphinyl, phosphino, phosphonium, keto, ester, alcohol, carbamate, urea, thiocarbonyl, borates, boranes, boraza, silyl, siloxy, silaza and combinations thereof; and combinations thereof; and

wherein X, Y and Z are independently selected from the group consisting of halide, oxo, aquo, hydroxo, alcohol, phenol, dioxygen, peroxo, hydroperoxo, alkylperoxo, arylperoxo, ammonia, alkylamino, arylamino, heterocycloalkyl amino, heterocycloaryl amino, amine oxides, hydrazine, alkyl hydrazine, aryl hydrazine, nitric oxide, cyanide, cyanate, thiocyanate, isocyanate, isothiocyanate, alkyl nitrile, aryl nitrile, alkyl isonitrile, aryl isonitrile, nitrate, nitrite, azido, alkyl sulfonic acid, aryl sulfonic acid, alkyl sulfoxide, aryl sulfoxide, alkyl aryl sulfoxide, alkyl sulfenic acid, aryl sulfenic acid, alkyl sulfinic acid, aryl sulfinic acid, alkyl thiol carboxylic acid, aryl thiol carboxylic acid, alkyl thiol thiocarboxylic acid, aryl thiol

thiocarboxylic acid, alkyl carboxylic acid (such as acetic acid, trifluoroacetic acid, oxalic acid), aryl carboxylic acid (such as benzoic acid, phthalic acid), urea, alkyl urea, aryl urea, alkyl aryl urea, thiourea, alkyl thiourea, aryl thiourea, alkyl aryl thiourea, sulfate, sulfite, bisulfate, bisulfite, thiosulfate, thiosulfite, hydrosulfite, alkyl phosphine, aryl phosphine, alkyl phosphine oxide, aryl phosphine oxide, alkyl aryl phosphine oxide, alkyl phosphine sulfide, aryl phosphine sulfide, alkyl aryl phosphine sulfide, alkyl phosphonic acid, aryl phosphonic acid, alkyl phosphinic acid, aryl phosphinic acid, alkyl phosphinous acid, aryl phosphinous acid, phosphate, thiophosphate, phosphite, pyrophosphite, triphosphate, hydrogen phosphate, dihydrogen phosphate, alkyl guanidino, aryl guanidino, alkyl aryl guanidino, alkyl carbamate, aryl carbamate, alkyl aryl carbamate, alkyl thiocarbamate aryl thiocarbamate, alkyl aryl thiocarbamate, alkyl dithiocarbamate, aryl dithiocarbamate, alkyl aryl dithiocarbamate, bicarbonate, carbonate, perchlorate, chlorate, chlorite, hypochlorite, perbromate, bromate, bromite, hypobromite, tetrahalomanganate, tetrafluoroborate, hexafluorophosphate, hexafluoroantimonate, hypophosphite, iodate, periodate, metaborate, tetraaryl borate, tetra alkyl borate, tartrate, salicylate, succinate, citrate, ascorbate, saccharinate, amino acid, hydroxamic acid, thiotosylate, and anions of ion exchange resins.

Claim 53 has been amended as follows:

53. (amended) The modified biomaterial of claim 50, wherein the non-proteinaceous catalyst for the dismutation of superoxide is selected from the group consisting of Compounds 1-54 of Table 1.

Claim 54 has been amended as follows:

54. (amended) The modified biomaterial of claim 50, wherein the non-proteinaceous catalyst for the dismutation of superoxide is selected from the group consisting of Compounds 16, 27, 38, 40, 42, 43, 51, 52, 53, and 54 of Table 1.

Claim 55 has been amended as follows:

55. (amended) The modified biomaterial of claim 51, 52, 53, or 54, wherein the non-proteinaceous catalyst is present at a concentration of about 0.001 to about 25 weight percent.

Claim 56 has been amended as follows:

56. (amended) The modified biomaterial of claim 51, 52, 53, or 54, wherein the non-proteinaceous catalyst is present at a concentration of about 0.01 to about 10 weight percent.

Claim 57 has been amended as follows:

57. (amended) The modified biomaterial of claim 51, 52, 53, or 54, wherein the non-proteinaceous catalyst is present at a concentration of about 0.05 to about 5 weight percent.

Claim 58 has been amended as follows:

58. (amended) The modified biomaterial of claim 197 comprising the non-proteinaceous catalyst for the dismutation of superoxide covalently bound to the surface of the biomaterial substantially compatible with a biological system.

Claim 59 has been amended as follows:

59. (amended) The modified biomaterial of claim 197 comprising a copolymer of the non-proteinaceous catalyst for the dismutation of superoxide and [the] a biomaterial monomer substantially compatible with a biological system.

Claim 60 has been amended as follows:

60. (amended) The modified biomaterial of claim 197 comprising an admixture of the non-proteinaceous catalyst for the dismutation of superoxide and the biomaterial substantially compatible with a biological system.

Claim 61 has been amended as follows:

61. (amended) The modified biomaterial of claim 197, wherein, upon exposure to a biological fluid, dissociation of the non-proteinaceous catalyst for the dismutation of superoxide or the precursor ligand from the biomaterial substantially compatible with a biological system is prevented by at least one covalent bond between the non-proteinaceous catalyst for the dismutation of superoxide or the precursor ligand and the biomaterial substantially compatible with a biological system.

Claim 62 has been amended as follows:

62. (amended) The modified biomaterial of claim 197, wherein, upon exposure to a biological fluid, dissociation of the non-proteinaceous catalyst for the dismutation of superoxide or the precursor ligand from the biomaterial substantially compatible with a biological system is prevented by ionic interactions between the non-proteinaceous catalyst for the dismutation of superoxide or the precursor ligand and the biomaterial substantially compatible with a biological system.

Claim 63 has been amended as follows:

alkyl aryl urea, thiourea, alkyl thiourea, aryl thiourea, alkyl aryl thiourea, sulfate, sulfite, bisulfate, bisulfite, thiosulfate, thiosulfite, hydrosulfite, alkyl phosphine, aryl phosphine, alkyl phosphine oxide, aryl phosphine oxide, alkyl aryl phosphine oxide, alkyl phosphine sulfide, aryl phosphine sulfide, alkyl aryl phosphine sulfide, alkyl phosphonic acid, aryl phosphonic acid, alkyl phosphinic acid, aryl phosphinic acid, alkyl phosphinous acid, aryl phosphinous acid, phosphate, thiophosphate, phosphite, pyrophosphite, triphosphate, hydrogen phosphate, dihydrogen phosphate, alkyl guanidino, aryl guanidino, alkyl aryl guanidino, alkyl carbamate, aryl carbamate, alkyl aryl carbamate, alkyl thiocarbamate aryl thiocarbamate, alkyl aryl thiocarbamate, alkyl dithiocarbamate, aryl dithiocarbamate, alkyl aryl dithiocarbamate, bicarbonate, carbonate, perchlorate, chlorate, chlorite, hypochlorite, perbromate, bromate, bromite, hypobromite, tetrahalomanganate, tetrafluoroborate, hexafluorophosphate, hexafluoroantimonate, hypophosphite, iodate, periodate, metaborate, tetraaryl borate, tetra alkyl borate, tartrate, salicylate, succinate, citrate, ascorbate, saccharinate, amino acid, hydroxamic acid, thiotosylate, and anions of ion exchange resins.

Claim 4 has been amended as follows:

4. (amended) The modified biomaterial of claim 197, wherein the non-proteinaceous catalyst for the dismutation of superoxide is selected from the group consisting of Compounds 1-54 of Table 1.

Claim 5 has been amended as follows:

5. (amended) The modified biomaterial of claim 197, wherein the non-proteinaceous catalyst for the dismutation of superoxide is selected from the group consisting of Compounds 16, 27, 38, 40, 42, 43, 51, 52, 53, and 54 of Table 1.

Claim 6 has been amended as follows:

6. (amended) The modified biomaterial of claim 2, 3, 4, or 5, wherein the non-proteinaceous catalyst is present at a concentration of about 0.001 to about 25 weight percent.

Claim 7 has been amended as follows:

7. (amended) The modified biomaterial of claim 2, 3, 4, or 5, wherein the non-proteinaceous catalyst is present at a concentration of about 0.01 to about 10 weight percent.

Claim 8 has been amended as follows:

8. (amended) The modified biomaterial of claim 2, 3, 4, or 5, wherein the non-proteinaceous catalyst is present at a concentration of about 0.05 to about 5 weight percent.

Claim 9 has been amended as follows:

9. (amended) The modified biomaterial of claim 197, wherein the [unmodified] biomaterial substantially compatible with a biological system is selected from the group consisting of[:] metals, ceramics, polymers, biopolymers, and composites thereof.

Claim 10 has been amended as follows:

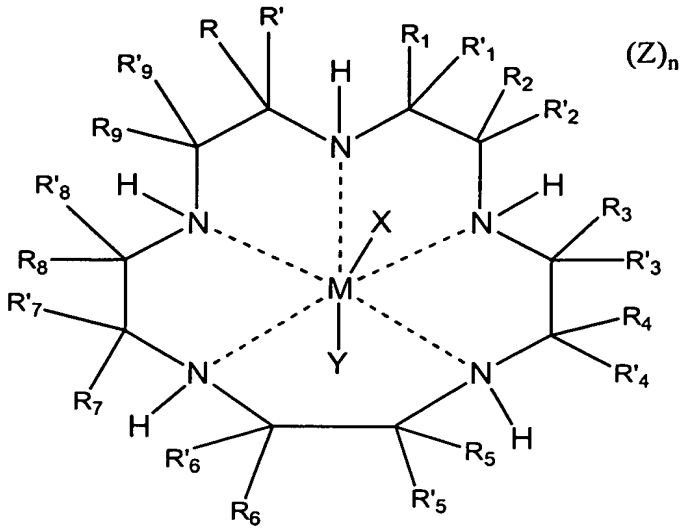
10. (amended) The modified biomaterial of claim 197, wherein the [unmodified] biomaterial substantially compatible with a biological system is a metal selected from the group consisting of[:] stainless steel, tantalum, titanium, nitinol, gold, platinum, inconel, iridium, silver, tungsten, nickel, chromium, vanadium, and alloys comprising any of the foregoing metals and alloys.

Claim 11 has been amended as follows:

11. (amended) The modified biomaterial of claim 10, wherein the non-proteinaceous catalyst for the dismutation of superoxide is selected from the group consisting of manganese(II) pentaaza complexes, manganese(III) pentaaza complexes, iron(II) pentaaza complexes, iron(III) pentaaza complexes, manganese(II) salen complexes, manganese(III) salen complexes, iron(II) salen complexes, iron(III) salen complexes, manganese(II) porphyrin complexes, manganese(III) porphyrin complexes, iron(II) porphyrin complexes, and iron(III) porphyrin complexes.

Claim 12 has been amended as follows:

12. (amended) The modified biomaterial of claim 10, wherein the non-proteinaceous catalyst for the dismutation of superoxide is selected from the group consisting of manganese and iron chelates of pentaazacyclopentadecane compounds, which are represented by the following formula:



wherein M is a cation of a transition metal[, preferably] selected from the group consisting of manganese [or] and iron;

wherein R, R', R_1, R'_1, R_2, R'_2, R_3, R'_3, R_4, R'_4, R_5, R'_5, R_6, R'_6, R_7, R'_7, R_8, R'_8, R_9, and R'_9 independently represent hydrogen, or substituted or unsubstituted alkyl, alkenyl, alkynyl, cycloalkyl, cycloalkenyl, cycloalkylalkyl, cycloalkylcycloalkyl, cycloalkenylalkyl, alkylcycloalkyl, alkylcycloalkenyl, alkenylcycloalkyl, alkenylcycloalkenyl, heterocyclic, aryl and aralkyl radicals;

wherein R_1 or R'_1 and R_2 or R'_2, R_3 or R'_3 and R_4 or R'_4, R_5 or R'_5 and R_6 or R'_6, R_7 or R'_7 and R_8 or R'_8, and R_9 or R'_9 and R or R' together with the carbon atoms to which they are attached independently form a substituted or unsubstituted, saturated, partially saturated or unsaturated cyclic or heterocyclic having 3 to 20 carbon atoms;

wherein R or R' and R_1 or R'_1, R_2 or R'_2 and R_3 or R'_3, R_4 or R'_4 and R_5 or R'_5, R_6 or R'_6 and R_7 or R'_7, and R_8 or R'_8 and R_9 or R'_9 together with the carbon atoms to which they are attached independently form a substituted or unsubstituted nitrogen containing heterocycle having 2 to 20 carbon atoms, provided that when the nitrogen containing heterocycle is an aromatic heterocycle which does not contain a hydrogen attached to the nitrogen, the hydrogen attached to the nitrogen as shown in the above formula, which nitrogen is also in the macrocyclic ligand or complex, and the R groups attached to the included carbon atoms of the macrocycle are absent;

wherein R and R', R_1 and R'_1, R_2 and R'_2, R_3 and R'_3, R_4 and R'_4, R_5 and R'_5, R_6 and R'_6, R_7 and R'_7, R_8 and R'_8, and R_9 and R'_9 together with the carbon atom to which they are attached independently form a saturated, partially saturated, or unsaturated cyclic or heterocyclic having 3 to 20 carbon atoms; and

wherein one of R, R', R_1, R'_1, R_2, R'_2, R_3, R'_3, R_4, R'_4, R_5, R'_5, R_6, R'_6, R_7, R'_7, R_8, R'_8, R_9, and R'_9 together with a different one of R, R', R_1, R'_1, R_2, R'_2, R_3, R'_3, R_4, R'_4, R_5, R'_5, R_6,

R'_6, R_7, R'_7, R_8, R'_8, R_9, and R'_9 which is attached to a different carbon atom in the macrocyclic ligand may be bound to form a strap represented by the formula:

$$- (CH_2)_x - M - (CH_2)_w - L - (CH_2)_z - I - (CH_2)_y -$$

wherein w, x, y and z independently are integers from 0 to 10 and M, L and J are independently selected from the group consisting of alkyl, alkenyl, alkynyl, aryl, cycloalkyl, heteroaryl, alkaryl, alkheteroaryl, aza, amide, ammonium, oxa, thia, sulfonyl, sulfinyl, sulfonamide, phosphoryl, phosphinyl, phosphino, phosphonium, keto, ester, alcohol, carbamate, urea, thiocarbonyl, borates, boranes, boraza, silyl, siloxy, silaza and combinations thereof; and combinations thereof; and

wherein X, Y and Z are independently selected from the group consisting of halide, oxo, aquo, hydroxo, alcohol, phenol, dioxygen, peroxo, hydroperoxo, alkylperoxo, arylperoxo, ammonia, alkylamino, arylamino, heterocycloalkyl amino, heterocycloaryl amino, amine oxides, hydrazine, alkyl hydrazine, aryl hydrazine, nitric oxide, cyanide, cyanate, thiocyanate, isocyanate, isothiocyanate, alkyl nitrile, aryl nitrile, alkyl isonitrile, aryl isonitrile, nitrate, nitrite, azido, alkyl sulfonic acid, aryl sulfonic acid, alkyl sulfoxide, aryl sulfoxide, alkyl aryl sulfoxide, alkyl sulfenic acid, aryl sulfenic acid, alkyl sulfinic acid, aryl sulfinic acid, alkyl thiol carboxylic acid, aryl thiol carboxylic acid, alkyl thiol thiocarboxylic acid, aryl thiol thiocarboxylic acid, alkyl carboxylic acid (such as acetic acid, trifluoroacetic acid, oxalic acid), aryl carboxylic acid (such as benzoic acid, phthalic acid), urea, alkyl urea, aryl urea, alkyl aryl urea, thiourea, alkyl thiourea, aryl thiourea, alkyl aryl thiourea, sulfate, sulfite, bisulfate, bisulfite, thiosulfate, thiosulfite, hydrosulfite, alkyl phosphine, aryl phosphine, alkyl phosphine oxide, aryl phosphine oxide, alkyl aryl phosphine oxide, alkyl phosphine sulfide, aryl phosphine sulfide, alkyl aryl phosphine sulfide, alkyl phosphonic acid, aryl phosphonic acid, alkyl phosphinic acid, aryl phosphinic acid, alkyl phosphinous acid, aryl phosphinous acid, phosphate, thiophosphate, phosphite, pyrophosphite, triphosphate, hydrogen phosphate, dihydrogen phosphate, alkyl guanidino, aryl guanidino, alkyl aryl guanidino, alkyl carbamate, aryl carbamate, alkyl aryl carbamate, alkyl thiocarbamate aryl thiocarbamate, alkyl aryl thiocarbamate, alkyl dithiocarbamate, aryl dithiocarbamate, alkyl aryl dithiocarbamate, bicarbonate, carbonate, perchlorate, chlorate, chlorite, hypochlorite, perbromate, bromate, bromite, hypobromite, tetrahalomanganate, tetrafluoroborate, hexafluorophosphate, hexafluoroantimonate, hypophosphite, iodate, periodate, metaborate, tetraaryl borate, tetra alkyl borate, tartrate, salicylate, succinate, citrate, ascorbate, saccharinate, amino acid, hydroxamic acid, thiotosylate, and anions of ion exchange resins.

Claim 13 has been amended as follows:

13. (amended) The modified biomaterial of claim 10, wherein the non-proteinaceous catalyst for the dismutation of superoxide is selected from the group consisting of Compounds 1-54 of Table 1.

Claim 14 has been amended as follows:

14. (amended) The modified biomaterial of claim 10, wherein the non-proteinaceous catalyst for the dismutation of superoxide is selected from the group consisting of Compounds 16, 27, 38, 40, 42, 43, 51, 52, 53, and 54 of Table 1.

Claim 15 has been amended as follows:

15. (amended) The modified biomaterial of claim 11, 12, 13, or 14, wherein the non-proteinaceous catalyst is present at a concentration of about 0.001 to about 25 weight percent.

Claim 16 has been amended as follows:

16. (amended) The modified biomaterial of claim 11, 12, 13, or 14, wherein the non-proteinaceous catalyst is present at a concentration of about 0.01 to about 10 weight percent.

Claim 17 has been amended as follows:

17. (amended) The modified biomaterial of claim 11, 12, 13, or 14, wherein the non-proteinaceous catalyst is present at a concentration of about 0.05 to about 5 weight percent.

Claim 18 has been amended as follows:

18. (amended) The modified biomaterial of claim 197, wherein the [unmodified] biomaterial substantially compatible with a biological system is a ceramic selected from the group consisting of[:] hydroxyapatite, tricalcium phosphate, and aluminum-calcium-phosphorous oxide.

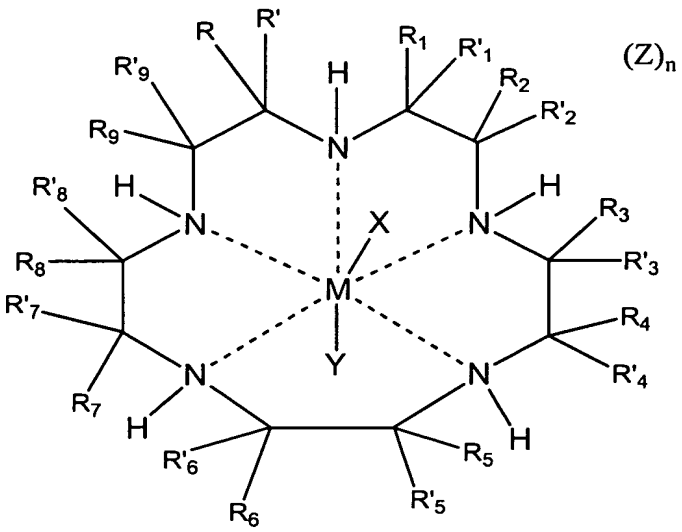
Claim 19 has been amended as follows:

19. (amended) The modified biomaterial of claim 18, wherein the non-proteinaceous catalyst for the dismutation of superoxide is selected from the group consisting of manganese(II) pentaaza complexes, manganese(III) pentaaza complexes, iron(II) pentaaza complexes, iron(III) pentaaza complexes, manganese(II) salen complexes, manganese(III) salen complexes, iron(II) salen complexes, iron(III) salen complexes,

manganese(II) porphyrin complexes, manganese(III) porphyrin complexes, iron(II) porphyrin complexes, and iron(III) porphyrin complexes.

Claim 20 has been amended as follows:

20. (amended) The modified biomaterial of claim 18, wherein the non-proteinaceous catalyst for the dismutation of superoxide is selected from the group consisting of manganese and iron chelates of pentaazacyclopentadecane compounds, which are represented by the following formula:



wherein M is a cation of a transition metal[, preferably] selected from the group consisting of manganese [or] and iron;

wherein R, R', R_1, R'_1, R_2, R'_2, R_3, R'_3, R_4, R'_4, R_5, R'_5, R_6, R'_6, R_7, R'_7, R_8, R'_8, R_9, and R'_9 independently represent hydrogen, or substituted or unsubstituted alkyl, alkenyl, alkynyl, cycloalkyl, cycloalkenyl, cycloalkylalkyl, cycloalkylcycloalkyl, cycloalkenylalkyl, alkylcycloalkyl, alkylcycloalkenyl, alkenylcycloalkyl, alkenylcycloalkenyl, heterocyclic, aryl and aralkyl radicals;

wherein R_1 or R'_1 and R_2 or R'_2, R_3 or R'_3 and R_4 or R'_4, R_5 or R'_5 and R_6 or R'_6, R_7 or R'_7 and R_8 or R'_8, and R_9 or R'_9 and R or R' together with the carbon atoms to which they are attached independently form a substituted or unsubstituted, saturated, partially saturated or unsaturated cyclic or heterocyclic having 3 to 20 carbon atoms;

wherein R or R' and R_1 or R'_1, R_2 or R'_2 and R_3 or R'_3, R_4 or R'_4 and R_5 or R'_5, R_6 or R'_6 and R_7 or R'_7, and R_8 or R'_8 and R_9 or R'_9 together with the carbon atoms to which they are attached independently form a substituted or unsubstituted nitrogen containing heterocycle having 2 to 20 carbon atoms, provided that when the nitrogen containing heterocycle is an aromatic heterocycle which does not contain a hydrogen attached to the

nitrogen, the hydrogen attached to the nitrogen as shown in the above formula, which nitrogen is also in the macrocyclic ligand or complex, and the R groups attached to the included carbon atoms of the macrocycle are absent;

wherein R and R', R_1 and R'_1, R_2 and R'_2, R_3 and R'_3, R_4 and R'_4, R_5 and R'_5, R_6 and R'_6, R_7 and R'_7, R_8 and R'_8, and R_9 and R'_9 together with the carbon atom to which they are attached independently form a saturated, partially saturated, or unsaturated cyclic or heterocyclic having 3 to 20 carbon atoms; and

wherein one of R, R', R_1, R'_1, R_2, R'_2, R_3, R'_3, R_4, R'_4, R_5, R'_5, R_6, R'_6, R_7, R'_7, R_8, R'_8, R_9, and R'_9 together with a different one of R, R', R_1, R'_1, R_2, R'_2, R_3, R'_3, R_4, R'_4, R_5, R'_5, R_6, R'_6, R_7, R'_7, R_8, R'_8, R_9, and R'_9 which is attached to a different carbon atom in the macrocyclic ligand may be bound to form a strap represented by the formula:

$$- (CH_2)_x - M - (CH_2)_w - L - (CH_2)_z - I - (CH_2)_y -$$

wherein w, x, y and z independently are integers from 0 to 10 and M, L and J are independently selected from the group consisting of alkyl, alkenyl, alkynyl, aryl, cycloalkyl, heteroaryl, alkaryl, alkheteroaryl, aza, amide, ammonium, oxa, thia, sulfonyl, sulfinyl, sulfonamide, phosphoryl, phosphinyl, phosphino, phosphonium, keto, ester, alcohol, carbamate, urea, thiocarbonyl, borates, boranes, boraza, silyl, siloxy, silaza and combinations thereof; and combinations thereof; and

wherein X, Y and Z are independently selected from the group consisting of halide, oxo, aquo, hydroxo, alcohol, phenol, dioxygen, peroxo, hydroperoxo, alkylperoxo, arylperoxo, ammonia, alkylamino, arylamino, heterocycloalkyl amino, heterocycloaryl amino, amine oxides, hydrazine, alkyl hydrazine, aryl hydrazine, nitric oxide, cyanide, cyanate, thiocyanate, isocyanate, isothiocyanate, alkyl nitrile, aryl nitrile, alkyl isonitrile, aryl isonitrile, nitrate, nitrite, azido, alkyl sulfonic acid, aryl sulfonic acid, alkyl sulfoxide, aryl sulfoxide, alkyl aryl sulfoxide, alkyl sulfenic acid, aryl sulfenic acid, alkyl sulfinic acid, aryl sulfinic acid, alkyl thiol carboxylic acid, aryl thiol carboxylic acid, alkyl thiol thiocarboxylic acid, aryl thiol thiocarboxylic acid, alkyl carboxylic acid (such as acetic acid, trifluoroacetic acid, oxalic acid), aryl carboxylic acid (such as benzoic acid, phthalic acid), urea, alkyl urea, aryl urea, alkyl aryl urea, thiourea, alkyl thiourea, aryl thiourea, alkyl aryl thiourea, sulfate, sulfite, bisulfate, bisulfite, thiosulfate, thiosulfite, hydrosulfite, alkyl phosphine, aryl phosphine, alkyl phosphine oxide, aryl phosphine oxide, alkyl aryl phosphine oxide, alkyl phosphine sulfide, aryl phosphine sulfide, alkyl aryl phosphine sulfide, alkyl phosphonic acid, aryl phosphonic acid, alkyl phosphinic acid, aryl phosphinic acid, alkyl phosphinous acid, aryl phosphinous acid, phosphate, thiophosphate, phosphite, pyrophosphite, triphosphate, hydrogen phosphate, dihydrogen phosphate, alkyl guanidino, aryl guanidino, alkyl aryl guanidino, alkyl

carbamate, aryl carbamate, alkyl aryl carbamate, alkyl thiocarbamate aryl thiocarbamate, alkyl aryl thiocarbamate, alkyl dithiocarbamate, aryl dithiocarbamate, alkyl aryl dithiocarbamate, bicarbonate, carbonate, perchlorate, chlorate, chlorite, hypochlorite, perbromate, bromate, bromite, hypobromite, tetrahalomanganate, tetrafluoroborate, hexafluorophosphate, hexafluoroantimonate, hypophosphite, iodate, periodate, metaborate, tetraaryl borate, tetra alkyl borate, tartrate, salicylate, succinate, citrate, ascorbate, saccharinate, amino acid, hydroxamic acid, thiotosylate, and anions of ion exchange resins.

Claim 21 has been amended as follows:

21. (amended) The modified biomaterial of claim 18, wherein the non-proteinaceous catalyst for the dismutation of superoxide is selected from the group consisting of Compounds 1-54 of Table 1.

Claim 22 has been amended as follows:

22. (amended) The modified biomaterial of claim 18, wherein the non-proteinaceous catalyst for the dismutation of superoxide is selected from the group consisting of Compounds 16, 27, 38, 40, 42, 43, 51, 52, 53, and 54 of Table 1.

Claim 23 has been amended as follows:

23. (amended) The modified biomaterial of claim 19, 20, 21, or 22, wherein the non-proteinaceous catalyst is present at a concentration of about 0.001 to about 25 weight percent.

Claim 24 has been amended as follows:

24. (amended) The modified biomaterial of claim 19, 20, 21, or 22, wherein the non-proteinaceous catalyst is present at a concentration of about 0.01 to about 10 weight percent.

Claim 25 has been amended as follows:

25. (amended) The modified biomaterial of claim 19, 20, 21, or 22, wherein the non-proteinaceous catalyst is present at a concentration of about 0.05 to about 5 weight percent.

Claim 26 has been amended as follows:

26. (amended) The modified biomaterial of claim 197, wherein the [unmodified] biomaterial substantially compatible with a biological system is a polymer selected from the group consisting of: polyurethane, polyureaurethane, polyalkylene glycols, polyethylene

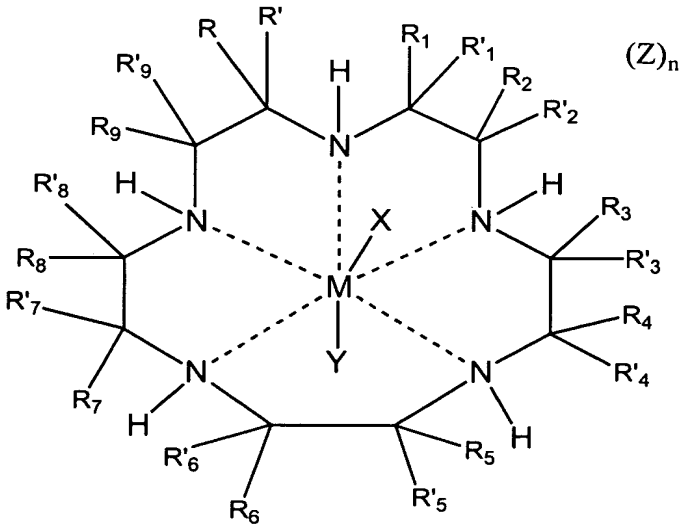
teraphthalate, ultra high molecular weight polyethylene, polypropylene, polyesters, polyamides, polycarbonates, polyorthoesters, polyesteramides, polysiloxane, polyolefins, polytetrafluoroethylene, polysulfones, polyanhydrides, polyalkylene oxides, polyvinyl halides, polyvinyledene halides, acrylic, methacrylic, polyacrylonitrile, polyvinyl, polyphosphazene, polyethylene-co-acrylic acid, silicone, block copolymer of any of the foregoing polymers, random copolymers of any of the foregoing polymers, graft copolymers of any of the foregoing polymers, crosslinked polymers of any of the foregoing polymers, hydrogels, and mixtures of any of the foregoing polymers.

Claim 27 has been amended as follows:

27. (amended) The modified biomaterial of claim 26, wherein the non-proteinaceous catalyst for the dismutation of superoxide is selected from the group consisting of manganese(II) pentaaza complexes, manganese(III) pentaaza complexes, iron(II) pentaaza complexes, iron(III) pentaaza complexes, manganese(II) salen complexes, manganese(III) salen complexes, iron(II) salen complexes, iron(III) salen complexes, manganese(II) porphyrin complexes, manganese(III) porphyrin complexes, iron(II) porphyrin complexes, and iron(III) porphyrin complexes.

Claim 28 has been amended as follows:

28. (amended) The modified biomaterial of claim 26, wherein the non-proteinaceous catalyst for the dismutation of superoxide is selected from the group consisting of manganese and iron chelates of pentaazacyclopentadecane compounds, which are represented by the following formula:



wherein M is a cation of a transition metal[, preferably] selected from the group consisting of manganese [or] and iron;

wherein R, R', R_1, R'_1, R_2, R'_2, R_3, R'_3, R_4, R'_4, R_5, R'_5, R_6, R'_6, R_7, R'_7, R_8, R'_8, R_9, and R'_9 independently represent hydrogen, or substituted or unsubstituted alkyl, alkenyl, alkynyl, cycloalkyl, cycloalkenyl, cycloalkylalkyl, cycloalkylcycloalkyl, cycloalkenylalkyl, alkylcycloalkyl, alkylcycloalkenyl, alkenylcycloalkyl, alkenylcycloalkenyl, heterocyclic, aryl and aralkyl radicals;

wherein R_1 or R'_1 and R_2 or R'_2, R_3 or R'_3 and R_4 or R'_4, R_5 or R'_5 and R_6 or R'_6, R_7 or R'_7 and R_8 or R'_8, and R_9 or R'_9 and R or R' together with the carbon atoms to which they are attached independently form a substituted or unsubstituted, saturated, partially saturated or unsaturated cyclic or heterocyclic having 3 to 20 carbon atoms;

wherein R or R' and R_1 or R'_1, R_2 or R'_2 and R_3 or R'_3, R_4 or R'_4 and R_5 or R'_5, R_6 or R'_6 and R_7 or R'_7, and R_8 or R'_8 and R_9 or R'_9 together with the carbon atoms to which they are attached independently form a substituted or unsubstituted nitrogen containing heterocycle having 2 to 20 carbon atoms, provided that when the nitrogen containing heterocycle is an aromatic heterocycle which does not contain a hydrogen attached to the nitrogen, the hydrogen attached to the nitrogen as shown in the above formula, which nitrogen is also in the macrocyclic ligand or complex, and the R groups attached to the included carbon atoms of the macrocycle are absent;

wherein R and R', R_1 and R'_1, R_2 and R'_2, R_3 and R'_3, R_4 and R'_4, R_5 and R'_5, R_6 and R'_6, R_7 and R'_7, R_8 and R'_8, and R_9 and R'_9 together with the carbon atom to which they are attached independently form a saturated, partially saturated, or unsaturated cyclic or heterocyclic having 3 to 20 carbon atoms; and

wherein one of R, R', R_1, R'_1, R_2, R'_2, R_3, R'_3, R_4, R'_4, R_5, R'_5, R_6, R'_6, R_7, R'_7, R_8, R'_8, R_9, and R'_9 together with a different one of R, R', R_1, R'_1, R_2, R'_2, R_3, R'_3, R_4, R'_4, R_5, R'_5, R_6, R'_6, R_7, R'_7, R_8, R'_8, R_9, and R'_9 which is attached to a different carbon atom in the macrocyclic ligand may be bound to form a strap represented by the formula:

$$- (CH_2)_x - M - (CH_2)_w - L - (CH_2)_z - I - (CH_2)_y -$$

wherein w, x, y and z independently are integers from 0 to 10 and M, L and J are independently selected from the group consisting of alkyl, alkenyl, alkynyl, aryl, cycloalkyl, heteroaryl, alkaryl, alkheteroaryl, aza, amide, ammonium, oxa, thia, sulfonyl, sulfinyl, sulfonamide, phosphoryl, phosphinyl, phosphino, phosphonium, keto, ester, alcohol, carbamate, urea, thiocarbonyl, borates, boranes, boraza, silyl, siloxy, silaza and combinations thereof; and combinations thereof; and

wherein X, Y and Z are independently selected from the group consisting of halide, oxo, aquo, hydroxo, alcohol, phenol, dioxygen, peroxo, hydroperoxo, alkylperoxo, arylperoxo, ammonia, alkylamino, arylamino, heterocycloalkyl amino, heterocycloaryl amino, amine oxides, hydrazine, alkyl hydrazine, aryl hydrazine, nitric oxide, cyanide, cyanate, thiocyanate, isocyanate, isothiocyanate, alkyl nitrile, aryl nitrile, alkyl isonitrile, aryl isonitrile, nitrate, nitrite, azido, alkyl sulfonic acid, aryl sulfonic acid, alkyl sulfoxide, aryl sulfoxide, alkyl aryl sulfoxide, alkyl sulfenic acid, aryl sulfenic acid, alkyl sulfinic acid, aryl sulfinic acid, alkyl thiol carboxylic acid, aryl thiol carboxylic acid, alkyl thiol thiocarboxylic acid, aryl thiol thiocarboxylic acid, alkyl carboxylic acid (such as acetic acid, trifluoroacetic acid, oxalic acid), aryl carboxylic acid (such as benzoic acid, phthalic acid), urea, alkyl urea, aryl urea, alkyl aryl urea, thiourea, alkyl thiourea, aryl thiourea, alkyl aryl thiourea, sulfate, sulfite, bisulfate, bisulfite, thiosulfate, thiosulfite, hydrosulfite, alkyl phosphine, aryl phosphine, alkyl phosphine oxide, aryl phosphine oxide, alkyl aryl phosphine oxide, alkyl phosphine sulfide, aryl phosphine sulfide, alkyl aryl phosphine sulfide, alkyl phosphonic acid, aryl phosphonic acid, alkyl phosphinic acid, aryl phosphinic acid, alkyl phosphinous acid, aryl phosphinous acid, phosphate, thiophosphate, phosphite, pyrophosphite, triphosphate, hydrogen phosphate, dihydrogen phosphate, alkyl guanidino, aryl guanidino, alkyl aryl guanidino, alkyl carbamate, aryl carbamate, alkyl aryl carbamate, alkyl thiocarbamate aryl thiocarbamate, alkyl aryl thiocarbamate, alkyl dithiocarbamate, aryl dithiocarbamate, alkyl aryl dithiocarbamate, bicarbonate, carbonate, perchlorate, chlorate, chlorite, hypochlorite, perbromate, bromate, bromite, hypobromite, tetrahalomanganate, tetrafluoroborate, hexafluorophosphate, hexafluoroantimonate, hypophosphite, iodate, periodate, metaborate, tetraaryl borate, tetra alkyl borate, tartrate, salicylate, succinate, citrate, ascorbate, saccharinate, amino acid, hydroxamic acid, thiotosylate, and anions of ion exchange resins.

Claim 29 has been amended as follows:

29. (amended) The <u>modified</u> biomaterial of claim 26, wherein the non-proteinaceous catalyst for the dismutation of superoxide is selected from the group consisting of Compounds 1-54 of Table 1.

Claim 30 has been amended as follows:

30. (amended) The <u>modified</u> biomaterial of claim 26, wherein the non-proteinaceous catalyst for the dismutation of superoxide is selected from the group consisting of Compounds 16, 27, 38, 40, 42, 43, 51, 52, 53, and 54 of Table 1.

Claim 31 has been amended as follows:

31. (amended) The modified biomaterial of claim 27, 28, 29, or 30, wherein the non-proteinaceous catalyst is present at a concentration of about 0.001 to about 25 weight percent.

Claim 32 has been amended as follows:

32. (amended) The modified biomaterial of claim 27, 28, 29, or 30, wherein the non-proteinaceous catalyst is present at a concentration of about 0.01 to about 10 weight percent.

Claim 33 has been amended as follows:

33. (amended) The modified biomaterial of claim 27, 28, 29, or 30, wherein the non-proteinaceous catalyst is present at a concentration of about 0.05 to about 5 weight percent.

Claim 34 has been amended as follows:

34. (amended) The modified biomaterial of claim 197, wherein the [unmodified] biomaterial substantially compatible with a biological system is a polyethylene glycol.

Claim 35 has been amended as follows:

35. (amended) The modified biomaterial of claim 34, wherein the non-proteinaceous catalyst for the dismutation of superoxide is selected from the group consisting of manganese(II) pentaaza complexes, manganese(III) pentaaza complexes, iron(II) pentaaza complexes, iron(III) pentaaza complexes, manganese(II) salen complexes, manganese(III) salen complexes, iron(II) salen complexes, iron(III) salen complexes, manganese(II) porphyrin complexes, manganese(III) porphyrin complexes, iron(II) porphyrin complexes, and iron(III) porphyrin complexes.

Claim 36 has been amended as follows:

36. (amended) The modified biomaterial of claim 34, wherein the non-proteinaceous catalyst for the dismutation of superoxide is selected from the group consisting of manganese and iron chelates of pentaazacyclopentadecane compounds, which are represented by the following formula:

63. (amended) The modified biomaterial of claim 197, wherein, upon exposure to biological fluid, dissociation of the non-proteinaceous catalyst for the dismutation of superoxide or the precursor ligand from the biomaterial substantially compatible with a biological system is prevented by hydrophobic interactions between the non-proteinaceous catalyst for the dismutation of superoxide or the precursor ligand and the biomaterial substantially compatible with a biological system.

Claim 197 has been added as follows:

197. A modified biomaterial useful for the dismutation of superoxide comprising:

(a) a biomaterial substantially compatible with a biological system; and

(b) at least one non-proteinaceous catalyst or precursor ligand of the non-proteinaceous catalyst attached to the biomaterial;

wherein the non-proteinaceous catalyst is capable of dismutating superoxide in the biological system.